EUROPE 1992 & THE ONTARIO AEROSPACE INDUSTRY

A REPORT PREPARED FOR THE
ONTARIO MINISTRY OF INDUSTRY, TRADE AND TECHNOLOGY

EUROPE 1992 AND THE ONTARIO AEROSPACE INDUSTRY

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EUROPE 1992 AND THE ONTARIO AEROSPACE INDUSTRY

EXECUTIVE SUMMARY

The 1990's are expected to bring a significant change to the economic environment in Europe. The pace of the integration of the major Western European markets under the auspices of the European Community (EC) has been accelerated in a process known as "Europe 1992". Under this process, national governments in the EC are committed to the elimination of all significant regulatory barriers to trade, investment and labour flows among member nations by the end of that year. These steps are designed to lead to the Single European Market.

In view of these developments on both economic and political fronts, the Ontario Ministry of Industry, Trade and Technology is seeking to deepen its understanding of the potential changes in the European aerospace market, and to identify opportunities for, and challenges to Ontario firms participating in domestic and export markets. Ernst & Young, drawing upon its resources in Europe and Canada, was commissioned to assist the Ministry with this study.

Ontario Aerospace Industry

Overall direct employment is about 30,000 to 35,000. Employment has grown by about 16% in the period 1987-1990. Current sales are approximately five billion dollars. The industry has averaged about 7% real growth annually over the last decade. The industry is highly trade oriented with about 75% of production being exported. The largest percentage of this, approximately 80%, is exported to the U.S.

The high export orientation of the Ontario aerospace industry is normally cited as one concrete indication of international competitiveness. In its 1989 Annual Survey, Industry, Science and Technology Canada projected that exports as a percentage of sales of the Canadian industry would increase from 71.1% in 1989 to 78.8% in 1993. A second indicator of competitiveness is the relative growth in sales. The average annual sales growth rates of the major national industries between 1978 and 1988 indicate a high level of competitiveness for the Canadian industry.

There are, however, signs that Ontario industry is starting to lose ground both to other provinces and to foreign competitors. Ontario companies are beginning to see inroads being made in both the domestic market and their main export market, the U.S.

It appears that price, quality and superior service to OEM's are the prime reasons for the increasing success of foreign competitors. Ontario's competitiveness while relatively high, has been decreasing due to a number of factors, including technology, human resources, infrastructure and government/industry relations.

EC Aerospace Industry

The EC aerospace industry is a major force in the global industry. While smaller than the U.S. industry, it is much larger than Canada's. It has grown more quickly than the U.S. industry in recent years. The EC firms are very competitive in terms of product and process technology. Productivity and profitability will improve as firms reach greater economies of scale through consolidation of markets and mergers and acquisitions.

Prime contractor companies, such as Airbus, have made major inroads into global markets. EC suppliers have benefitted from this success. There have also been significant improvements in the competitiveness of engine manufacturers.

The EC industry is now in a balanced trading position overall having been a major net importer in 1981.

EC Policies

The Single European Market of 1992 is expected to have only a relatively weak impact on the EC aerospace industry. As a result of the huge investment costs involved, the industry already operates essentially on a global scale .

However, there are a range of policies being pursued by the EC Commission that will have certain effects which are specific to the aerospace industry:

- technical standards
- air transport liberalization
- environmental policy
- research & development
- public procurement

In addition, many policies which affect European industry in general will also affect the aerospace industry. In this category we find:

- competition policy
- company law
- taxation
- social policy
- trade policy

Opportunities, Challenges, and Responses

The specific market opportunities which may develop in Europe over the next decade will be the result of a number of inter-related factors, each of which are difficult to predict. These include:

- the actual impact of EC 1992 and other European policy initiatives
- general market forces driving demand (i.e. GDP growth, fleet replacement)
- levels of military spending
- developments in Eastern Europe, and
- specific actions taken by major aerospace companies.

The intention of this report is not to estimate or forecast market segment sizes after considering these and other influencing factors. Rather, we describe general opportunities that are likely to emerge to make Europe a more desirable place for Ontario aerospace companies to do business.

The competitive structure of the European aerospace industry is evolving as companies are repositioning themselves to compete in the new European market and worldwide. Some manifestations of this include mergers and acquisitions and redirection of the focus of some company activity. Less efficient companies in both the civil and military sector may have trouble competing with more dynamic and efficient firms, especially if a measure of national protection and procurement is taken away.

It appears that the European aerospace industry will become a more significant competitor in the future as it seeks to expand its presence globally. European firms may provide greater competition for Ontario firms both in domestic markets and in the U.S. market. On the other hand, entry into European markets may provide the best opportunities for growth for many Ontario companies.

The specific responses open to Ontario companies wishing to address these opportunities will clearly have to be tailored to individual circumstances including:

- financial strength
- autonomy/mandate
- management capabilities
- product attributes
- process technologies, and
- R&D capabilities.

Given the inter-relationships of Ontario companies, increased EC sales by a prime would have a major impact on the other three categories. Primes and some suppliers of major sub-systems would be in a favourable position to increase sales. The major sub-contractors' success will be limited unless they are able to develop broad mandates for supplying a number of primes with different products. Most third tier suppliers will likely be successful in Europe only where the product is input into a system or final product.

Our research indicates that there are four basic strategic options available to companies wishing to increase their penetration of the European market:

- Participating in research and development projects, either with individual companies or groups of companies under private sector arrangements or under governmental auspices;
- Concentrating on selling to European primes or suppliers of major systems;
- Entering into joint ventures with European companies; or,
- Acquiring a European company.

A simplistic analysis of these options suggests that the most desirable options for a prime are export into the EC market or make an acquisition. Major sub-contractors would generally be restricted by their subsidiary status and small size and there does not appear to be a preferred option. Third tier suppliers may be most effective through supplying larger companies.

EUROPE 1992 AND THE ONTARIO AEROSPACE INDUSTRY

1.0 INTRODUCTION

1.1 BACKGROUND

The 1990's are expected to bring a significant change to the economic environment in Europe. The pace of integration of the major Western European markets under the auspices of the European Community[1] (EC) has been accelerated in a process known as "Europe 1992". Under this process, national governments in the EC are committed to the elimination of all significant regulatory barriers to trade, investment and labour flows among member nations by the end of that year. These steps are designed to lead to the Single European Market.

At the same time, political changes in Eastern Europe have launched, in varying degrees, a process of economic reform in Poland, Czechoslovakia, Hungary, Romania and Bulgaria, with similar reforms in the Soviet Union itself. The most extreme change in Eastern Europe is the re-unification of Germany and the "disappearance" of East Germany.

These changes in the political and economic map of Europe are occuring at the same time as the aerospace industry is becoming increasingly competitive. Major aerospace companies such as Boeing are facing increasing competition from the Pacific Rim. Companies are increasingly forming international alliances for research, development and manufacturing projects.

In view of these developments on both economic and political fronts, the Ontario Ministry of Industry, Trade, and Technology is seeking to deepen its understanding of the potential changes in the European aerospace market, and to identify opportunities for, and challenges to Ontario firms participating in domestic and export markets. Ernst & Young, drawing upon its resources in Europe and Canada, was commissioned to assist the Ministry with this study.

[1]The EC comprises Germany, France, the U.K., Italy, Ireland, Spain, Portugal, Greece, Belgium, Denmark, Luxembourg, and the Netherlands

1.2 PURPOSE OF THIS STUDY

This study is directed at two related objectives. First, it provides basic market research to Ontario aerospace companies which could either export products to the EC or which face competition from EC companies in their traditional markets. The majority of market information is presented at a final product level (ie. Airbus 320) or a total sales level. This is appropriate since much of the Ontario industry acts as supplier to the final assemblers of aerospace products. The second largest segment of the Ontario industry manufactures proprietary systems (ie.automated test equipment) which are sufficiently specialized that no market data is available.

Finally, the study identifies European policies, for example those associated with 1992, and others, which will impact the development of the aerospace industry in EC member countries. The implications that these changes hold for the Ontario aerospace industry are described below.

1.3 INDUSTRY SCOPE

The aerospace industries in Ontario and the European Community can be divided into four main sub-sectors as follows:

- airframes,
- engines,
- space, and
- materials and equipment.

The data provided on the EC industry encompasses these segments.

In both the EC and Ontario industries, there is a large proportion of the aerospace business which is dedicated to military sales. The military portion was covered in much less detail because of the strong national procurement considerations which will not be affected immediately by the European policy changes discussed in this report.

The major difference between the industries is in the scope of operation. There are more companies in the EC industry, and they tend to be larger.

1.4 METHODOLOGY

This study employed techniques including secondary research, industry interviews and a workshop.

Secondary research on the EC aerospace industry and the changing regulatory climate associated with EC 1992 and other policy initiatives was conducted primarily by the European Community Office (ECO) of Ernst & Young in Brussels. The major sources used were documents published by the European Commission and previous studies on the aerospace industry.

Sources of information on the Ontario industry also included material provided to Ernst & Young by aerospace companies for the preparation of a directory of companies for Metropolitan Toronto. The results from an aerospace and defense workshop held on June 16, 1990, sponsored by Metropolitan Toronto and the Government of Ontario, and organized by Ernst & Young, were also incorporated into our understanding of the industry.

The ECO also conducted several interviews with EC officials responsible for various policies which would impact the aerospace industry.

To strengthen our understanding of the Ontario industry and its views on the EC 1992 events, we conducted a number of interviews with the CEO's of a representative sample of firms. This sample included 20 firms across a wide range of products and services. Personal interviews were conducted with a"test group" of five firms and telephone interviews were conducted with the remainder. Questions were posed regarding each firm's previous experiences in accessing EC market and their views on possible roles for the Ontario government in aiding the industry.

At the conclusion of this research, a workshop was held to share the findings and discuss the implications for Ontario business. The workshop was attended by our Ontario industry expert, our ECO representatives, and the Ernst & Young Europe senior aerospace partner as well as two representatives of the Ministry.

Subsequent to the workshop meeting, some additional research and analysis was conducted and this report was prepared.

1.5 ORGANIZATION OF THIS REPORT

This report is divided into five chapters including this Introduction. Chapter Two is an overview of the key issues affecting the competitiveness of the Ontario aerospace industry. Chapter Three contains an overview of the EC industry, focussing largely on the civil side. Chapter Four provides a detailed review of changes in the EC regulatory environment resulting from 1992 and other policy initiatives. Chapter Five draws conclusions regarding the opportunities for Ontario firms based upon the findings of the previous three chapters and provides a brief description of the basic alternatives for addressing the EC 1992 opportunities with examples of non-EC companies that have addressed the EC 1992 issue.

2.0 THE ONTARIO AEROSPACE INDUSTRY

2.1 INTRODUCTION

The following description of the Ontario aerospace industry focuses on the key factors that will ultimately determine the industry's ability to compete in the emerging global industry. The Government of Ontario has recent data on the industry contained in the Premier's Council Report and in a directory of aerospace companies which is currently under development. Rather than reproducing this data, we believe that it is more useful to set the stage for our analysis of the Ontario industry and EC 1992 by providing a general overview of the key factors affecting the industry's long-term competitiveness versus the European industry.

2.2 DESCRIPTION OF THE INDUSTRY

Many Ontario companies sell products which are in some way incorporated into products easily identifiable as "aerospace products." However, many of these should not be defined as aerospace companies. We estimate that there are approximately 150 companies in the industry, using selection criteria of a reasonable percentage of sales to the industry and minimum levels of sales/employee.

Table 1 below provides a summary comparison of the Canadian industry versus the EC and U.S. industries. The Canadian industry is very small in comparison, being 10% and 5% of the EC and U.S. industries, respectively, in terms of sales and employees.

TABLE 1

1988 COMPARISON OF AEROSPACE INDUSTRIES

	Sales (millions of ECU)[2]	Employees	Sales/Employee (ECU)
EC	39,645	507,192	78,165
U.S.	75,209	971,000	77,455
Canada	4,054	49,000	82,735

Source: EC - DG III

Although much smaller than the other industries, the Canadian one compared favourably in terms of sales per employee in 1988.

Table 2 below shows the average exports and imports for the Canadian industry between 1985 and 1989.

TABLE 2

CANADIAN AEROSPACE TRADE PERCENTAGE OF EXPORTS AND IMPORTS (AVERAGE 1985-89)

Geographical Area	Exports	Imports
U.S.	70%	85%
E.C.	15%	10%
Other	15%	5%

Source: Ernst & Young, ISTC, and AIAC

[2]The European Currency Unit (ECU) represents the value of a basket of EC currencies versus another currency. In 1988, 1 ECU equalled $US 1.18

Exports to the EC consist largely of sales of Pratt & Whitney engines, Boeing de Havilland aircraft, and some proprietary products to OEM's. Total exports will rise as Canadair increases sales of components to Airbus. Exports to other regions are largely by Pratt & Whitney, Boeing de Havilland, and Spar Aerospace. Imports consist largely of finished aircraft.

Figures for the Ontario industry are not published, but an analysis of the Canadian industry and Ontario's place in it suggests the following. Overall direct employment is about 30,000 to 35,000 and employment has grown by about 16% in the period 1987 to 1990. Current sales are approximately five billion dollars. The industry has averaged about 7% real growth annually over the last decade. It has grown at a slightly lower rate than the U.S. industry but at a greater rate than European industry. The industry is highly trade oriented with about 75% of production being exported. The largest percentage of exports, approximately 80%, is directed to the U.S.

Current predictions are for continued growth, although recent and projected declines in military spending and the increasing uncertainty surrounding short term economic prospects for the world economy may mean that these forecasts are optimistic. While the Ontario industry is expected to grow in the next few years, that gain will not match the growth in sales of the Quebec industry. Therefore, Ontario's share of Canadian industry sales is expected to decrease to around 40% by 1994 from the current level of 50% of industry sales.

The Ontario industry can be divided into a number of segments. The major companies in each segment and their products are described below.

Prime contractor

- Boeing de Havilland.

Major sub-systems

- Menasco Aerospace Ltd. (Landing gear systems, flight control actuation systems, electrohydraulic systems, ground steering systems, variable wing sweep and ramp and door actuation systems.),
- Dowty Canada Limited (Aircraft landing systems and industrial and marine hydraulic systems.),
- Spar Aerospace Limited (Satellites and satellite subsystems) and
- Litton Systems Canada Limited (Airborne and marine electronics).

Major sub-contractors

- the best examples of these are McDonnell Douglas and Fleet Aerospace.

Third tier suppliers

- approximately two-thirds to three quarters of the total industry supplies 'build to print' products and services.

The composition of the industry indicates a fairly large supplier base supporting a small number of major primes and systems suppliers.

2.3 KEY FACTORS

International Competitiveness

The high export orientation of the Ontario aerospace industry is normally cited as a concrete indication of international competitiveness, as indeed it has been. In its 1989 Annual Survey, Industry, Science and Technology Canada projected that exports as a percentage of sales of the Canadian industry would increase from 71.1% in 1989 to 78.8% in 1993.

A second indicator of competitiveness is relative growth in sales. Table 3 below compares the average annual sales growth rates of the major national industries between 1978 and 1988.

TABLE 3

AVERAGE ANNUAL SALES GROWTH RATE IN CONSTANT PRICES (1978-88)

EC	6.2%
U.S.	4.6%
JAPAN	7.1%
CANADA	10.9%

Source: EC DG III

This favourable comparison indicates a high level of competitiveness for the Canadian industry over this time period.

There are, however, signs that Ontario industry is starting to lose ground both to other provinces and to foreign competitors. Ernst & Young industry interviews, industry data, and research done for the Premiers Council support this conclusion. Ontario companies are beginning to see inroads being made in both the domestic market and their main export market, the U.S. These are being made by both Asian and European competitors. Canada's position as lead supplier of aerospace products to the U.S. has been taken over by France and the U.K.

Competition from suppliers outside the country is also beginning to impact upon Ontario suppliers that provide products and services to Ontario-located primes and major systems suppliers such as Boeing deHavilland and McDonnell Douglas. Some components formerly supplied to Ontario OEM's are now being supplied by Korean and U.K. firms.

It appears that both price, quality and superior service to OEM's are the prime reasons for the increasing success of foreign competitors. Ontario's decreasing competitiveness has resulted from a number of factors, the major ones falling under the headings of: technology, human resources, infrastructure and government / industry relations. These and other related factors are discussed below.

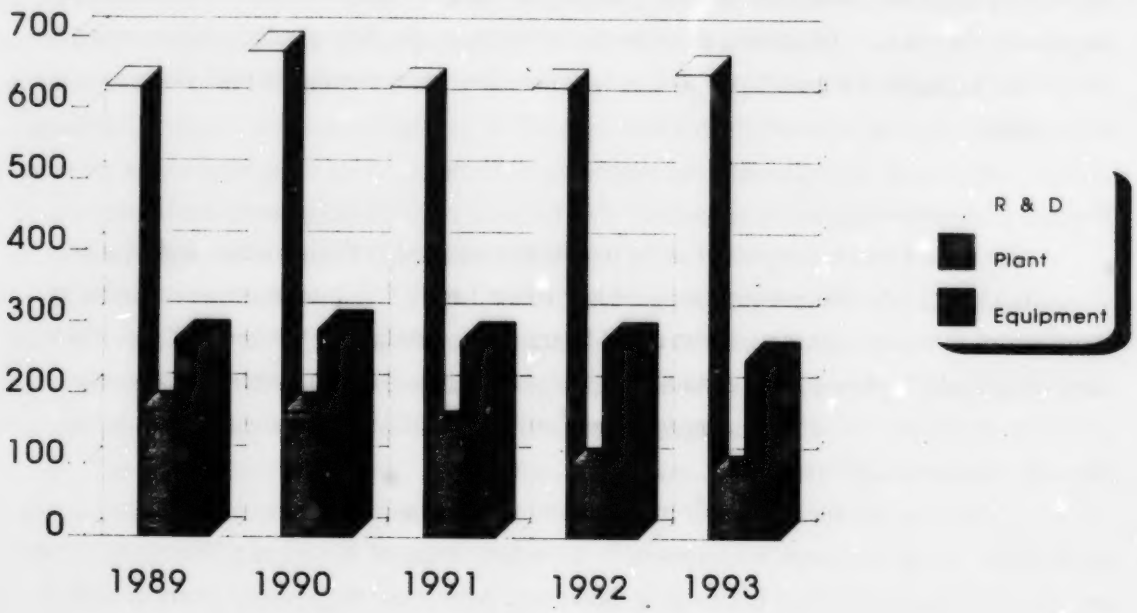
Technology

Aerospace companies must aggressively build on past successes to remain competitive. In organizations that are at the leading edge of global competition, it has been recognized that continuous innovation leading to technological change is a powerful source of competitive advantage. Technological change is important both in terms of the technology that is embodied in product and that which is involved in improving the 'manufacturability' of the products, or the key manufacturing processes of the industry.

In terms of product technology, the Ontario industry has many examples of innovation. This includes complete aircraft such as the DASH 8, and specific products such as those mentioned elsewhere in this section. Innovation has resulted in the development of specialty products which have captured significant shares in niche markets.

While there is a considerable amount of product innovation currently occuring in Ontario industry, the industry appears to be placing less emphasis on process innovation as a major source of competitive advantage. This is especially significant in those areas where labour costs put the industry at a disadvantage with Asian competitors.

CANADIAN INDUSTRY INVESTMENT
($ millions)



Source: 1989 ISTC Annual Survey

While good data is not available on investment in the industry, it appears that the current overall level of investment may not be sufficient to sustain the development of a long term competitive position of the industry. The problem is perhaps greater in that a few companies account for the vast bulk of investment being made. For example, Boeing deHavilland have invested very large amounts in the modernization of their manufacturing operations.

With regard to 'manufacturability', or process technology, many companies in the industry are involved in 'build to print' type operations. While this was acceptable in the past, buyers are now demanding greater participation from suppliers in both the design and problem solving associated with components manufactured by the supplier.

The global industry is adopting the philosophies of total quality management and continuous improvement. The leading edge for the development of these process skills in Canada appears to be the automotive industry and this is being done under strong pressure from foreign competition and the existence of Japanese owned firms in the Province. The U.S. industry is moving to implement these basic changes in manufacturing. While a few companies in Ontario are moving in this direction, including McDonnell Douglas, there are few indications that the aerospace industry as a whole is implementing these new manufacturing concepts.

The philosophy of designing major systems has changed in the last five to ten years, largely due to the pioneering work done in Japan. The integration of product and process technology that has resulted has had the effect of reducing design time and enabling quicker response to the market, improving the manufacturability of the final product and reducing its design and manufacturing cost. Ontario industry has had little experience with this new philosophy.

Human Resources

The labour and management skills required to succeed in the aerospace industry are changing rapidly. At a recent workshop on key issues facing the Ontario aerospace industry, shortages of motivated personnel who could be trained as production workers and machinists were identified. Technologists, certain categories of engineers and management personnel skilled in the areas of continuous improvement and total quality management were also identified as areas of shortage.

In addition, the formal labour management process has not been conducive to implementation of new work situations or to the achievement of increased productivity. There are some indications that this is changing, however. After more than twenty years of strikes during contract negotiations, Boeing deHavilland has recently negotiated a new contract with its workforce without a strike.

Industrial Infrastructure

Ontario industry has, in the past, benefited from a good infrastructure, both within the Province and in the country as a whole. Ontario companies can source significant inputs within the Province through a broadly based group of suppliers. Work force and engineering skills have allowed for the development of unique and state of the art products for the industry.

Currently, however, senior managers within the industry see numerous examples of emerging deficiencies in infrastructure holding back the development of the industry. For example, the lack of specialized education and skills development in the areas of emerging technologies and lack of specialized research facilities have all been cited as factors inhibiting development.

Two other infrastructure problems identified by people in the industry which affect the aerospace industry as well as many others are congestion at Pearson Airport and the congested road systems in the Toronto area.

Foreign Ownership

Many of the key companies in the Ontario industry are foreign owned. Companies such as Menasco, Garrett, Indal, Dowty, Boeing deHavilland, Raytheon and McDonnell Douglas are subsidiaries of major aerospace corporations. This foreign ownership has had beneficial effects in terms of access to technology, markets and manufacturing expertise. For example, the original deHavilland technology came from Europe. McDonnell Douglas has provided access to orders for major systems in civil aircraft. The ownership of deHavilland by Boeing has provided the financial and technological strength required to implement improvements in capital equipment, organization and design philosophy.

On the other hand, Canadian subsidiaries have varying degrees of independence and mandates from their foreign head offices. In some cases, Canadian subsidiaries have followed a more restrictive path of development than if decisions had been made locally. The potential for capitalizing on the opportunities in Europe may also be restricted.

The potential sale of Boeing de Havilland has renewed debates about the advantages and disadvantages of foreign ownership.

U.S. Ties

The Ontario and U.S. industries are closely integrated. This is, in part, because the U.S. represents a major market for aerospace final products, systems and components. It is also because some Ontario subsidiaries of U.S. corporations are specifically mandated to provide components and systems to their U.S. operations. McDonnell Douglas Canada is a good example of this.

These ties to the U.S. market have resulted in a steadily increasing level of exports of components, subsystems, specialized components and complete aircraft to that country and this has been beneficial to the overall development of the industry in the Province. While the strong U.S. orientation of Ontario's aerospace industry has been a source of considerable strength it may also have inhibited companies from exploring other potential markets, especially Europe. In addition, it has resulted in the Ontario industry becoming very reliant on the fortunes of the U.S. industry.

Global Markets

Due to a long history of international sales, a small number of companies operating in segments such as finished aircraft and some specialty areas such as temperature control systems and landing gears have developed considerable expertise in operating in foreign markets outside of North America. Menasco Aerospace and Garrett Canada are two examples of such companies.

Otherwise, the industry has focussed on sales to governments, airlines, suppliers and original equipment manufacturers within North America.

This North American focus has been positive for the industry. However, given the globalization of the aerospace industry, more companies need to gain international exposure and experience.

Civil / Military Split

The industry in Ontario is largely civilian oriented with probably less than twenty percent of its business in the military area. While there are significant exceptions to this civilian focus, such as Litton Systems and Indal Technologies, the civil industry has benefited from a high level of orders for commercial aircraft and is not likely to be adversely affected by declining defence expenditures.

Although the industry, in statistical terms, is clearly civilian oriented, there has always been a strong defence-oriented mentality in the industry resulting from the large number of people in the industry who came from the military side. This may well have resulted in a disproportionate effort being directed toward relations with the Department of National Defense, to securing contracts with DND and with trying to sell directly to the U.S. military.

Range of products

Ontario industry produces a broad range of products ranging from specialty systems and components to complete aircraft, destined largely for export. Some parts of the industry have focused on niche markets. This includes inertial navigation systems and systems designed to recover and secure aircraft aboard ships. Thus, the industry is, to a degree, shielded from the adverse impact of a downturn in a specific market. However, certain companies are vulnerable in this respect due to an over-reliance on a limited product offering.

Government / Industry Relations

The competitive forces which will increasingly drive the global aerospace competitive environment in the 1990's are in the areas of manufacturability, total quality control, innovation, infrastructure, human resources and government/industry development strategies. Many governments have joined with companies in their jurisdictions to define the key capabilities which will ensure international competitiveness and create a plan to develop these.

The Japanese have targeted a number of areas (engines, airframes), as have Korea (major machined components), Singapore (repair and overhaul) and others. The European aerospace industry is currently restructuring to meet the competitive needs of this decade.

In Canada, the Quebec government has fostered aggressive expansion of its aerospace industry. National organizations such as the Export Development Corporation and the Canadian Commercial Corporation have assisted foreign sales. Finally, the existence of a good and internationally credible Department of Transport in Ottawa has furthered the export orientation of the industry by establishing and maintaining the credibility of Canadian products.

Ontario industry and government are in the process of articulating how they can work together to ensure competitiveness in the 1990's.

Summary

This brief overview of the Ontario aerospace industry has profiled an industry which has shown itself to be a strong international competitor in the past. What is less clear is the degree to which: technology is currently being developed in the industry, human resources are being fostered, infrastructure is being upgraded and government / industry relations are keeping pace with international competitive requirements.

Overall this is being manifested in a general uncertainty within the industry as to where its future lies.

The review of EC 1992 and the potential threats and opportunities for Ontario companies must consider the competitiveness of the industry. In the emerging global industry, Ontario has strengths and weaknesses which need to be considered, particularly in the areas of technology, human resources, foreign ownership, and product/market orientation. The past record of exports, particularly to the U.S., is not an indication that the Ontario industry will be sufficiently competitive to address the threats and opportunities resulting from EC 1992 and other international developments such as the rise in competition from the Pacific Rim.

3.0 EC INDUSTRY OVERVIEW

The aerospace industry is a truly global industry. Companies from the United States, Europe, Japan and Canada sell their products around the world. There is also, increasingly, a high degree of international cooperation in research and development efforts. This section will describe briefly the world aerospace industry and then provide some additional information regarding the companies operating within the European Community.

3.1 The EC Aerospace Industry in a Global Context

Industry Size

As shown in Table 4 below, the United States has the largest aerospace industry in the world with sales in 1988 of approximately 78 billion ECU ($US 92 bn). In comparison, European Community aerospace sales for the same period are 32 billion ECU ($US 38 bn) as shown on table 5. Both Japan and Canada are much smaller players, with total sales in the 4 billion ECU ($US 5 bn) range.

TABLE 4

	Current Prices ECU (bn)		Constant Prices ECU 1985 (bn)		Rate of Growth 1985 Prices		Employment (000)	
	EC	USA	EC	USA	EC	USA	EC	USA
1978	9.2	24.5	16.5	70.1	-	8.7%	NA	720
1979	10.6	28.0	16.8	78.3	1.9%	11.6%	424	842
1980	14.1	34.0	19.4	86.9	15.5%	11.0%	472	902
1981	16.7	49.1	20.6	89.3	5.7%	2.8%	500	900
1982	18.4	59.9	21.3	86.4	3.5%	3.1%	483	831
1983	19.3	72.0	21.4	89.9	0.8%	4.0%	482	830
1984	21.5	84.2	22.7	86.0	6.2%	4.4%	465	850
1985	24.7	103.3	24.7	103.3	8.5%	20.2%	481	939
1986	24.5	86.5	27.3	108.7	10.3%	5.2%	488	967
1987	29.	77.7	28.8	114.8	5.7%	5.6%	492	992
1988	31	77.9	29.3	114.0	1.6%	0.7%	502	975

Source: EC DG III

TABLE 5

EC AEROSPACE INDUSTRY TURNOVER

Millions of ECU	1980	1981	1982	1983	1984	1985	1986	1987e	1988e	1990p
Current Sales	17,253	21,370	23,915	25,572	27,898	30,623	33,929	35,540	38,990	45,600
Constant Sales (ECU 1980)	17,253	19,069	20,015	20,564	21,409	22,260	24,517	24,980	26,430	29,000
Index	100	123.8	138.6	148.2	161.7	177.5	196.6	206	226	264
Constant Index	100	110.5	116	119.2	124.1	229	142.1	145	153	168
Euopean Production Consolidated (at the community level										
Current Sales	14,137	16,723	18,392	19,269	21,522	24,734	27,511	28,800	31,600	34,800
Constant Sales	14,137	14,919	15,436	15,553	16,562	18,002	19,914	20,280	21,450	23,600
Index	100	118.3	130.1	136.3	152.2	174.9	194.6	204	224	246
Constant Index	100	105.5	109.2	110	117.1	127.3	140.8	143	152	167
European Production Unconsolidated										
Current Sales	20,394	25,409	28,419	30,179	32,552	35,452	39,950	42,000	46,000	51,000
Divided by segment:										
- airframes	11,043	13,589	15,386	16,295	17,218	18,177	18,712	19,480	-	-
- engines	3,998	5,028	5,642	5,249	5,829	6,649	7,181	7,470	-	-
- equipment	4,710	6,017	6,346	7,504	8,195	8,704	11,871	12,470	-	-
- space	643	775	1,046	1,132	1,310	1,922	2,186	2,580	-	-
Divided by Market:										
- military	14,276	17,834	19,871	20,371	22,170	23,562	25,210	26,300	-	-
Civil %	30	29.8	30.1	32.5	31.9	33.5	36.9	37.4	-	-

Source: AECMA

In constant ECU's, the EC industry grew by 78% between 1978 and 1988 versus growth of 63 % for the U.S. industry. Both industries have experienced a minor increase in employment over the same period which reflects a major improvement in labour productivity.

Company Size

On a company-specific level, U.S. aerospace companies are the largest aerospace companies in the world. Table 6 shows that British Aerospace, the largest aerospace company in the EC, would only rank sixth in comparison to the U.S. companies. Similarly, the largest Japanese aerospace company would only rank 15th against the U.S. firms. The 17th U.S. firm, Cessna is smaller than the 15th EC firm, Fiat Aviazione.

TABLE 6

RELATIVE SIZE OF EC AEROSPACE COMPANIES VERSUS U.S. AND JAPANESE COMPANIES

	17 Largest U.S. Companies	Sales 1987 (ECU mn)	17 Largest EC Companies	Sales 1987 (ECU mn)	4 Largest Japanese Companies	Sales 1987 (ECU mn)
1.	Boeing	13,400	British Aerospace	5,768	Mitsubishi	1,891
2.	McDonnell Douglas	10,514	Aerospatiale	3,596	Kawasaki Hi	756
3.	General Electric[1]	10,500	MBB	2,943	IHI	583
4.	Lockheed	9,794	Rolls Royce	2,914	Fuji Hi	234
5.	UTC[2]	7,381	Dassault	2,246		
6.	General Motors	5,500e	Snecma	1,355		
7.	Northrop	5,280	Aeritalia	1,062		
8.	General Dynamics	4,952	Matra	950		
9.	Raytheon.	4,746	Saab	750		
10.	Rockwell	4,427	Dornier	645		
11.	Allied Signal	4,101	MTU	630		
12.	Martin Marietta	3,547	Agusta	614		
13.	Textron	3,382	Westland	540		
14.	Grumman	2,173	Fokker	452		
15.	LTV	1,205	Fiat Aviazione	428		
16.	Sundstrand	869	Casa	356		
17	Cessna	409	AEG	275		

[1] Power systems + flight systems.

[2] Jet engines + aerospace.

Source: EC and industry

Proportion of GDP

As a percentage of national output, the aerospace industry represents a relatively large proportion (@ 2.1%) of the gross domestic product of both Great Britain and the U.S. The EC average is approximately 1%. The French aerospace industry represents a larger than average but declining proportion of GDP. The Canadian industry represents 0.9% of GDP, which is a greater proportion than for Germany, Italy, Belgium, the Netherlands and Japan. Over the 15 year period from 1972 to 1987, this percentage has increased marginally for most countries.

Productivity

Table 7 compares three EC companies (M.B.B., Aerospatiale, and British Aerospace) to three U.S. companies (Boeing, McDonnell Douglas, and Lockheed) in terms of relative productivity. Value-added per employee was higher for each of the U.S. firms in 1987 than for EC firms. The average salary cost per employee is roughly the same between the EC and the U.S. with the notable exception of British Aerospace which is significantly lower. The average productivity, as measured by value-added over total salary costs, is approximately 15% higher in the U.S. companies as compared to the EC companies.

TABLE 7

PRODUCTIVITY COMPARISON

	1983	1984	1985	1986	1987
Value - Added per Employee (in '000 ECUs)					
M.B.B.	33	36	34	34	36
Aerospatiale	-	-	51	36	37
British Aerospace	20	23	25	24	23
Boeing	49	58	62	50	40
McDonnell Douglas	43	51	56	45	39
Lockheed	47	55	59	48	43
Total Salary per Employee (in '000 ECUs)					
M.B.B.	26	28	29	32	34
Aerospatiale	-	-	32	34	36
British Aerospace	17	19	20	19	19
Boeing	38	44	46	38	32
McDonnell Douglas	33	38	41	34	30
Lockheed	37	43	45	37	32
Productivity (Value Added/Total Salary)					
M.B.B.	1.26	1.28	1.18	1.08	1.05
Aerospatiale	-	-	1.56	1.05	1.02
British Aerospace	1.15	1.20	1.20	1.24	1.23
Boeing	1.30	1.31	1.36	1.34	1.23
McDonnell Douglas	1.31	1.34	1.35	1.30	1.28
Lockheed	1.27	1.29	1.31	1.30	1.32

Source: EC DG III

Costs

European aerospace companies generally have lower salary levels than U.S. aerospace companies. However, the economies of scale reached by the major players in the U.S. industry have not been reached by the EC. This puts the EC at a distinct disadvantage in terms of the amortization of research and development costs.

Profitability

Table 8 compares the profitability of U.S. and EC firms. The U.S. has outperformed the EC over the course of the 1980's. Looking at profit as a percentage of sales revenues, European aerospace companies have fluctuated between -0.8% and +3.0% over the 1980's. In comparison, U.S. aerospace companies fall within the much more profitable range of 2.8% to 4.4%.

TABLE 8

PROFITABILITY OF LARGE AEROSPACE COMPANIES
(Net Income/Sales)

	1980	1981	1982	1983	1984	1985	1986	1987e	1988e
EC companies	1.5%	1.5%	-0.85*	-0.6%*	2.2%	3.0%	2.1%	0.3%	1.7%
US companies	4.3%	4.4%	3.3%	3.5%	4.1%	3.1%	2.8%	4.1%	4.3%

* *The losses of 1982 and 1983 are due to the write-offs of one company. Without these, the profitability would be 0.5% in 1982 and 1.3% in 1983.*

Source: AECMA

Market share

As shown in Table 9, in 1988 European aerospace companies sold 25% of their production in the EC member countries. This gave them an EC market share of just more than 25% for civilian business. Sales in the U.S. were 50% greater than in the EC, giving them a much lower market penetration of 17%.

In comparison, U.S. aerospace companies sold almost 50% of their production in their domestic market, giving them a U.S. market share of approximately 80%. U.S. manufacturers held a 70% share of the EC market.

TABLE 9

DELIVERIES OF CIVILIAN AIRCRAFT IN 1988
Billions of ECU

	Origin of Construction			
Markets	**EC**	**U.S.A.**	**Rest of World**	**Total**
EC	1.0	2.7	0.1	3.8
Rest of Europe	0.4	0.5	0.0	0.9
USA	1.5	6.8	0.2	8.5
Rest of World	1.2	4.6	0.2	6.0
Total	4.1	14.6	0.5	19.2

Source: EC DG III

Exports and Imports

As shown on the following page, as part of the trend toward globalization of the aerospace industry, EC trade with other countries has increased dramatically between 1981 and 1987. Exports more than doubled to approximately 6 billion ECU ($US 6.9 bn) while imports rose 40 % to 6 billion ECU. The industry is now in a balanced position overall having been in a major deficit position in 1981.

Significant improvements have been achieved in the trade balances for aircraft and engines although there are fluctuations from year to year. The relatively steady improvement in the trade balance for engines demonstrates major gains in competitiveness. The EC industry remains a net importer of equipment and materials.

TABLE 10

TRADE PERFORMANCE OF THE EC CIVILIAN AEROSPACE INDUSTRY
Millions of ECU

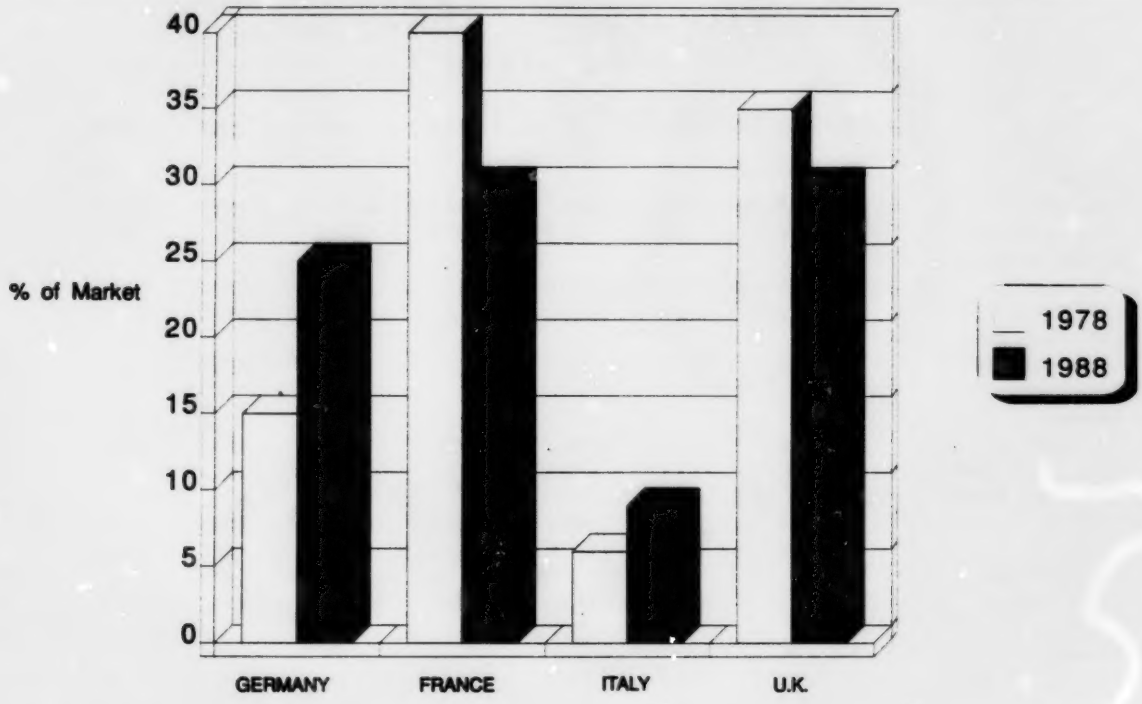
	1981	1982	1983	1984	1985	1986	1987
Export							
Total Sales	2,766.7	4,151.2	4,467.5	6,296.9	6,910.8	6,182.8	5,983.8
Index (1981=100)	100	150	161.5	227.6	249.8	223.5	216.3
Divided by Segment							
- airframes	2,115.6	3,030.7	2,790.9	3,961.6	3,704.1	2,956.4	2,651.3
- engines	351.3	756.6	1,284.0	1,873.1	2,647.2	2,653.0	2,804.7
- equipment and other materials	299.8	363.9	392.6	462.2	559.6	573.4	527.9
Imports							
Total Sales	4,297.8	3,574.8	4,022.1	4,973.5	603.6	6,160.5	6,023.5
Index (1981=100)	100	83.1	93.5	115.7	142	143.3	140.1
Divided by Segment							
- airframes	2,491.9	1,453.8	1,491.1	1,721.4	2,660.3	2,186	2,633.3
- engines	1,326	1,564.9	1,877.8	2.500.2	2,637.8	2,543.6	2,635.4
- equipment and other materials	479.9	556.0	653.3	752.0	805.4	801.0	754.8
Balance							
Total Trade Balance	-1,531.1	576.4	445.4	1,323.2	807.2	22.3	-39.7
- airframes	-376.3	1,576.9	1,299.8	2,240.2	1,043.8	140.5	18.0
- engines	-974.7	-808.3	-593.8	-627.1	9.4	109.4	169.3
- equipment and other materials	-180.1	-192.1	-260.6	-289.8	-245.9	-227.6	-227

Source: AECMA

3.2 The Structure of the EC Aerospace Industry

In 1987, four countries dominated the aerospace industry, the largest being Great Britain at 34% of the total EC production. Between 1978 and 1987, the U.K. market share has remained constant while Germany has increased from 15% to 24%, France has declined from 40% to 31% and Italy has grown from 6% to almost 9%.

EC MARKET SHARE BY COUNTRY



Source: EC DG III

The German industry is growing rapidly and is concentrated largely in the civilian sector. Italy has a few large and well-protected companies which dominate its industry.

The major companies in each country are shown on the following page.

TABLE 11

THE MAJOR PLAYERS: SALES AND EMPLOYMENT
(Millions of ECU)

	Sales	Employees 1988
Great Britain		
British Aerospace	5,993	87,500
Rolls Royce	2,919	40,900
Westland	530	9,163
France		
Aerospatiale	3,996	36,000
Dassault	2,520	13,318
Snecma	1,427	13,482
Matra	996	5,586
Germany		
MBB	3,430	38,774
Telefunken Systemtechnik AEG	1,106	9,885
Dornier	748	9,178
MTU	695	7,787
Italy		
Aeritalia	1,290	16,000
Agusta	718	9,500
Fiat Aviazione	430	4,800
Netherlands		
Fokker	879	11,000
Spain		
Casa	561	10,652
Sweden		
Saab	722	7,816

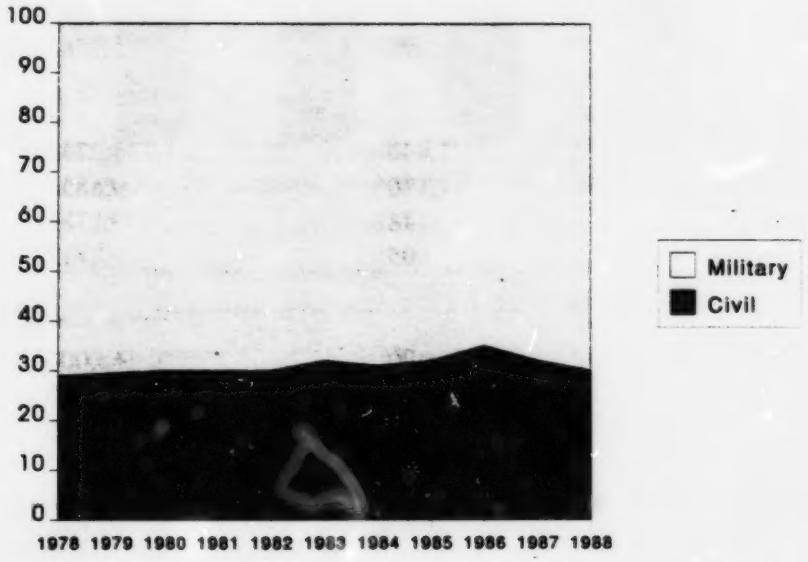
Source: AECMA

Civil vs. Military

As in the United States, EC aerospace companies are active in both military and civilian markets. For example, the military sector accounts for 50% of Aerospatiale's sales and 60% of Dassault's.

While the European industry has grown in real terms, the proportion of business split between military and civilian business has not changed very dramatically between 1978 and 1988. Military business accounted for approximately 65% of industry sales. The largest proportion of the growth in military business came before 1982. The subsequent slowdown was due partly to a reduction in many countries' defence budgets and to a drying up of export markets, especially in the Middle East.

SALES BREAKDOWN BY ACTIVITY



Source: EC DG III

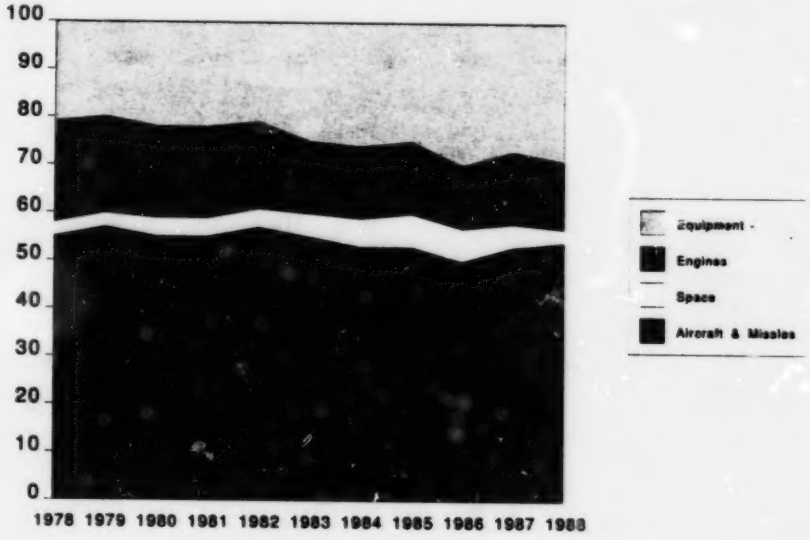
The situation is exactly the opposite in the civilian sector which represents 35% of industry sales. Since 1982 there has been steady growth in the demand for civilian aircraft, due both to an increase in air transport generally and to the need for new aircraft to replace aging fleets. The proportion of civil business is expected to increase due to constraints on military spending in many countries.

Industry Segmentation

Broadly speaking, the aerospace industry is segmented into four sub-sectors: air frames and missiles, space, engines and equipment. Over the previous decade, the emphasis of the European aerospace industry has shifted. The air frames and missiles sub-sector has declined from 54% of European aerospace sales in 1980 to 46% in 1988 despite an increase in the number of airframes delivered and increased sales in constant ECU's.

In contrast, the space sub-sector has grown from 3.1% to 6.1% over the same period. Also, there has been a slight decrease in the position of the engines sub-sector and an increase in the position of the equipment sub-sector.

SALES BREAKDOWN BY SUB-SECTOR



Source: EC DG III

Air Frames and Missiles

In terms of civilian passenger aircraft, the strength of the European industry is reflected in the success of Airbus Industrie, a consortium of seven major EC aerospace companies from the UK, France, West Germany and Spain. Airbus' delivery capabilities have increased from 4,000 seats per year in 1980 to 20,000 in 1988. This is forecast to increase further to approximately 40,000 seats per year in 1993.

As shown below, the EC industry has delivered anywhere from 51 to 75 commercial jets per year between 1980 and 1987. The increase in orders from a low of 29 to a high of around 230 over the same period indicates the market success of EC companies.

TABLE 12

EC PRODUCTION OF COMMERCIAL JETS

Deliveries		**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**
Airbus	A300	37	37	46	19	19	16	10	11	17
	A310	--	--	-17	29	26	19	21	28	
British Aerospace	B111	3	3	2	1	--	--	--	--	--
	B146	--	--	--	8	10	20	24	23	22
Fokker	F28	13	12	10	17	16	13	13	1	0
	F100									
Airbus	A320	---	---	---	---	---	---	---	---	16
Total Deliveries		53	51	58	62	74	75	66	56	94
Orders										
Airbus	A300	36	15	3	--	11	24	7	29	21
	A310	12	10	--	6	15	29	17	27	24
	A330								12	3
Airbus	A340								68	3
British Aerospace	B146	--	4	4	24	6	25	14	30	40
Fokker	F28	18	12	20	8	9	21	2	2	0
	F100	--	--	--	--	8	30	47	1	32
Airbus	A320	---	---	---	---	51	39	146	58	116
Total Orders		66	35	29	38	96	168	233	227	239

Source: AECMA

The table on the following page shows that the commuter turboprop aircraft manufacturers have also had considerable success during the 1980's. Deliveries have risen from a low of 33 to a high of 141. Orders increased from 40 to 216. EC manufacturers have captured a 66% share of new commuter aircraft orders and 65% of deliveries. Fokker is one example of a successful EC company in the regional commuter planes market.

The helicopter market is growing again after a mild recession from 1983 to 1986. It represents about 5% of the European civil aerospace production. The main European companies involved are Aerospatiale, MBB, Westland and Agusta. The first two companies, Aerospatiale and MBB, have entered into a cooperative arrangement in helicopters. U.S. competitors in this industry are Boeing, Sikorsky, Bell and McDonnell Douglas.

TABLE 13

EC PRODUCTION OF TURBOPROP PLANES

Deliveries*										
ATR 42							2	29	40	44
British Aerospace	HS748	7	9	3	7	6	5	1	1	1
	ATP	--	--	--	--	--	--	--	--	8
Fokker	F27	15	15	16	17	10	13	16	1	0
	F50	--	--	--	--	--	--	--	--	8
Casa/Nurtanio	CN235	--	--	--	--	--	--	2	13	12
Saab	340	--	--	--	--	12	26	37	33	28
Short	330	24	19	12	3	2	--	1	--	--
	360	---	---	2	28	30	25	14	20	16
Total Deliveries		46	43	33	55	60	71	100	115	141
Total Orders		54	40	222	169	58	117	82	151	216

* Aircraft with more than 29 seats, including Saab 2000

Source: AECMA

Engines

As shown on the following page, the engine segment of the industry has grown 92% between 1980 and 1988 as measured by sales. This increase came about largely due to the increased sales of U.S. air frames with engines produced or co-produced in Europe. It is expected that the European engine industry will also benefit from the increased demand attributed to the Airbus A320 and A330 air frames. As in the other sub-sectors, there have been successful cooperative arrangements among EC companies in the engine area, particularly the CFM 56 effort between GE and SNECMA. These two companies have recently announced a joint venture to build a new engine.

TABLE 14

EUROPEAN ENGINE PRODUCTION
(Millions of ECU)

	1980	1981	1982	1983	1984	1985	1986	1987e	1988e
Sales of Engines									
Current Value	3,998	5,028	5,642	5,249	5,829	6,649	7,181	7,470	7,690
Index	100	125.7	141.1	131.3	145.8	166.3	179.6	186.8	192.4
Employment (000's)	102.52	112	95.02	91.58	82.03	83.08	81.45	81.45	79.66
Deliveries to civilian engines (Thrust greater than 10 tonnes)									
CFM 56*	0	13	161	175	196	275	338	352	411
RB211	151	195	148	65	43	98	71	76	74
Total	**151**	**208**	**309**	**240**	**239**	**273**	**409**	**428**	**485**

including engines for space systems.

* In cooperation with the U.S., 50% G.E.

Source: AECMA

Space

As shown on table 15, the space segment of the European industry saw an increase in sales between 1982 and 1988 from 537 million ECU ($US 526 mn) to 1.6 billion ECU ($US 1.9 bn). Over the same period employment increased from 12,700 to 21,000. The future of the space segment appears very promising since the European Space Agency will have a number of major initiatives underway over the next few years. These include the scientific and experimental programs, the Arean 5, and the Columbus and Hermes projects.

TABLE 15

EUROPEAN SPACE PRODUCTION
(Millions of ECU)

	1980	1981	1982	1983	1984	1985	1986	1987e	1988e
Sales									
Consolidated	467	514	537	684	861	1,291	1,410	1,600	1,750
Nonconsolidated	643	775	1,046	1,132	1,310	1,922	2,186	2,580	2,850
Segmented									
R&D&governments	230	242	351	450	471	734	475	-	-
Commercial Europe	332	455	603	555	728	1,071	1,289	-	-
Export	82	77	91	127	111	117	423	-	-
Memo Items:									
Employment (estimate in 000's)	12,685	11,764	13,720	13,902	15,612	17,401	19,847	21,000	22,000
Launches of European Satellites	0	2	2	1	3	3	2	2	6
Launches of Ariane	1	2	1	2	4	4	3	2	7

Source: AECMA

Equipment

The equipment sector is expected to grow in proportion to growth in the rest of the aerospace industry. Avionics companies are now in the process of merging or forming alliances to share their expanding development costs and to bid for specific contracts on major new ventures, such as the European Fighter Aircraft (EFA) or Airbus A330 or A340 projects. Avionics is becoming an increasingly important segment of the aerospace industry due to the necessity of reducing the operating costs associated with flying modern aircraft, where maintenance, crew and fuel costs reach 51% of total operating costs.

3.3 EC INDUSTRIAL COOPERATION

In the past 20 years, the EC industry has increased its integration through both mergers and acquisitions and cooperative development programs. An example of the cooperative program approach in the civilian sector is Airbus Industrie. Seven major EC companies are involved in the development of this civilian aircraft program. On the military side, five major companies are involved in the EFA project. Some companies, such as British Aerospace and MBB, are involved in both. A greater number of military sector programs, however, are expected to be multilateral as opposed to bilateral efforts as a "European" approach to defense emerges.

Smaller manufacturers such as Dornier, Fokker and Shorts tend to concentrate on their own product development programs and consequently have a slower growth rate. Except for the military sector, where Turbo-Union is the supplier of the Tornado and EFA engines, European cooperation is not as prevalent in the engines sub-sector as it is in air frames and missiles.

Rolls Royce has very strong programs for the civilian engine business. Other large European engine manufacturers, such as FIAT Aviazione, work in cooperative programs to develop military engines.

Research and Development

The largest area of EC industrial cooperation is in research and development initiatives. Research and development spending accounts for approximately 15% of total industry sales in the EC. The largest share of this is focussed on military applications although civilian applications do result from these efforts.

The main areas of R&D expenditures are aerodynamics, materials, engines, avionics, and computer-aided manufacturing and design. New materials and avionics are two particularly important areas where significant advancements have been made. Regarding the former, materials technology can improve fuel efficiency and safety performance, thereby generating lower operating costs. For example, the Airbus A320 has more than 3 times the composites as the Airbus A300. Regarding the latter, it is apparent that avionics have become an increasingly sophisticated and integral segment of the aerospace industry due to the necessity of coping with ever increasing volumes of air traffic.

The future direction of R&D spending in Europe is unclear. A reduction in military spending would negatively impact R&D spending. There is a growing concern in the EC that the European aerospace industry is not spending as much on R&D as is necessary to successfully compete in the global market.

4.0 EC POLICY IMPACTS

The Single European Market of 1992 is expected to have only a relatively weak impact on the EC aerospace industry. As a result of the huge investment costs involved, the industry essentially operates on a global scale already.

However, there are a range of policies being pursued by the EC Commission that will have certain effects which are specific to the aerospace industry:

- technical standards
- air transport liberalization
- environmental policy
- research & development
- public procurement

In addition, although the effects will not be peculiar to aerospace, many policies which affect European industry in general will affect the aerospace industry as much as any other industry. In this category we find:

- competition policy
- company law
- taxation
- social policy
- trade policy

4.1 TECHNICAL STANDARDS

General

As part of 1992, the EC is adopting a "new approach" to technical harmonization. The new approach directives are limited to defining "essential requirements" for protection of health, safety and the environment. Member States must presume that products falling within these directives comply with the requirements of the directives, if they make reference to a European standard. It is the European Committee for Standards and the European Committee for Electrotechnical Standardization (CEN/CENELEC), the non-governmental standardization bodies, which develop technical standards for the EC. The principle of mutual recognition applies to all non-essential national regulations.

For instance, in the Machine Safety Directive, half the engineering sector is covered in just a few pages. But then several hundred standards need to be implemented by CEN/ CENELEC to fully implement the Directive.

Non-EC aerospace companies may be able to influence the development of standards if they have European subsidiaries. The European Association of Aerospace Manufacturers (AECMA) is the body which draws up European aerospace series standards. After work done in technical committees, AECMA then submits its agreed upon standards to CEN for approval. Non-EC companies with European operations can delegate representatives to the meetings of the technical committees. A list of 1500 draft standards currently being worked on is available.

Although non-EC companies can have some input to the standards-making process, they have no direct say in European testing and certification procedures. Canadian products requiring EC certification have to receive final certification from a European certifying authority.

In April 1990 the EC showed the first signs of improving its testing and certification procedures when it was agreed to create the European Organization for Testing and Certification (EOTC) which includes the EFTA states. The EOTC will work towards the mutual recognition of testing procedures in Europe. However, the generally slow progress in aligning testing and certification procedures in Europe is illustrative of the extraordinary amount of work that remains to be done in the whole area of technical standards.

Specific to Aviation

In the near future, the Commission is expected to table a proposal for the harmonization of safety standards concerning aircraft certification, operation and maintenance. The objective is to raise safety standards to the highest levels achieved within the EC. Where safety is concerned, the Commission wants to take its own measures, but where standard-setting is not directly for safety purposes (or for health & environment), the work is left to CEN/CENELEC.

There has been a recognition in Europe for a long time that there may be a need for common European safety standards, which might not always coincide with U.S. standards. This led to the establishment of the Joint Airworthiness Authorities (JAA) in 1970. This now establishes Joint Aviation Requirements (JARs) for its 12 members (not the EC 12) - Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, Switzerland and the U.K. The original JARs pertained to standards only.

Table 16 on the next page summarizes the JARs which have either been completed or are proposed. These JARs are aimed to produce high safety standards.

TABLE 16

JOINT AVIATION REQUIREMENTS (J.A.R.)

Purpose	Code	Status
large aeroplane design	JAR 25	complete
all-weather operations	JAR AWO	complete
engine design	JAR E	complete
propeller design	JAR P	complete
auxiliary power units	JAR APU	complete
sailplanes & powered sailplanes	JAR 22	complete
equipment	JAR 22	incomplete
helicopter design	JAR 29,27	incomplete
certification procedures	JAR 21	incomplete
maintenance organizations	JAR 145	incomplete

Certification

Following a 1987 agreement, the JAA members agreed to deepen their cooperation beyond pure standards-setting to the actual certification of products. The new set-up parallels the American equivalent and produces Joint Aviation Requirements, like the FAA produces FARs (federal aviation requirements).

Now, new European aviation products are certified by a European team, composed of experts of different nationalities. The certification procedures have been defined after some initial trials. Some products were certified by representatives from two authorities (eg., ATR 42), others by four (eg., Airbus 320).

The team which certified Boeing's 747-400 for Europe last year requested some modifications to the model from the U.S. version. Boeing had obtained FAA certification for the 747-400 on the basis that it was a derivative of the original 747. This greatly simplified the US certification procedure. However, when it came to European certification, the JAA pointed out that the original 747 was certified 20 years before the latest one, thus the new model was only a derivative in a very formal way. Boeing claimed Europe was using this certification process as a non-tariff barrier to trade.

A new European plane designed for the world market may have to go through only two certification procedures, one for the FAA and one for Europe. This is a great improvement for European manufacturers. Adhering to the JAR standards is only optional for JAA members at present.

Expanding Role of the J.A.A. in the Future

The JAA is now working to draw up airworthiness standards in maintenance and operations to ease the exchange of products within Europe. Maintenance services will be easily exchanged once every maintenance organization is approved to similar standards. The sharing of aircraft, personnel or ground facilities should become easier, without being at the expense of safety.

The purpose of the proposed directive is to give more authority to the JAA, which is only a voluntary arrangement at present, and to encourage its evolution into a single European aviation authority. It is hoped to enforce this measure by 1993. The technical standards and procedures will also be applied to imported aircraft.

4.2 AIR TRANSPORT LIBERALIZATION

The EC intends to deregulate or liberalize air traffic. The philosophy is to deregulate while avoiding what are seen as the adverse side-effects of American deregulation such as industry upheaval and reconcentration of market share. This will be accomplished through complementary social measures, plus a still-evolving competition policy. Some examples of the changes are as follows:

- **FARE-SETTING** The EC will move towards a system whereby both governments concerned by a particular route would have to disapprove of the fare proposed by an airline in order for that fare to be blocked.

- **MARKET ACCESS** In June, 1990 as part of a further package of liberalizing measures, it was agreed in principle to give a third country airline the right to operate a route between two member states provided the route had at least 100,000 passengers in the previous year.

- **CAPACITY-SHARING** Under a recent agreement any EC carrier operating third or fourth freedom traffic rights will be able to increase its share on those routes to 67.5% before a national government can intervene, as of November 1990. Previously, both airlines on a route were entitled to a 50% share of the business. The plan is to abolish capacity sharing by 1993.

- **INTER-REGIONAL AIR SERVICES** Under a June agreement, these services will now be free to operate between main airports, whereas they had been confined to services between regional and main airports.

- **SLOT ALLOCATION** The EC has promised action to revise the procedures by which departure and landing slots are allocated.

- **AIRPORT LANDING FEES** The EC plans to intervene to control the rapid increases in airport landing fees.

- **SOCIAL/TECHNICAL HARMONIZATION MEASURES** These include the controversial proposal to limit the maximum time that pilots can fly in a given period of time, as well as a proposal for mutual acceptance of navigation certificates.

A package of reforms in 1987 covered only passenger air services. Freight was included in the latest proposals. The Member States are committed to moving towards the implementation of a single cabotage area, although it is not clear whether or not this will be in place by 1993.

Mergers & Alliances

While the purpose of the Single Market is to allow larger and stronger firms to emerge, there are concerns that certain mergers and alliances might restrict the level of competition. Two deals which the Commission are currently investigating to assess their consequences for competition are the BA/Sabena/KLM cooperation pact to develop Brussels as a hub airport and the Air France takeover of the largest other French airline (UTA) which could give Air France control over 97% of French domestic traffic. The Commission is also seeking wider powers to prevent predatory pricing by airlines.

Air Traffic Congestion

Several authoritative sources have recently pointed to the costs likely to be imposed by capacity constraints at European airports over the coming years.

In its annual report on the civilian jet aircraft market, the European aircraft consortium, Airbus Industrie, predicted that by the year 2000, twenty-four airports in Europe would reach full capacity by being unable to accommodate any additional flight movements or frequencies. This, it said, will be an important reason why air transport deregulation will not lead to any reduction in European air fares in the 1990's. Heavy demand for prime take-off and landing slots at European hub or congested airports, the introduction of VAT on fares and other costs to cover the expense of improving ground and air traffic control services are all likely to counteract the price benefits of liberalization, it forecasts.

Meanwhile, the International Civil Airports Association (ICAA) has also painted a picture of growing restrictions on European air travel. It believes that traffic at Europe's twenty-seven largest airports will rise from 333 million passengers in 1989 to more than 697 million by the year 2005. However, it says that government and public concerns over the environmental implications of aircraft noise and the expansion of airport facilities may contribute to restricting the growth of the industry.

At a meeting in Paris on 24 April, 1990, the European Civil Aviation Conference (which includes most European governments except those from the East) was able to announce some positive action in response to the perceived problems. Following on from the ECAC's first ministerial accord in 1988, the plan is to set up a central air traffic management unit which will be operational from 1993. With Eurocontrol as the manager, the aim will be to harmonize the air traffic control systems used in the busiest areas (the UK, France, the Benelux and northern Germany) by 1995 and elsewhere by 1998.

Effects of Air Transport Deregulation on Aerospace

Increased demand for larger, two-aisle civil aircraft is expected as airspace and airport landing slots become ever more scarce and valuable.

The demand for smaller passenger aircraft is expected to increase as those with turboprop engines are particularly suited for regional air travel. Regional air travel is expected to expand because of greater demand and also because of efforts to reduce congestion at large international airports by redistributing passengers to smaller, regional airports.

The Commission is pushing for the creation of a European high speed rail network, which will provide strong competition for European airlines on their short haul routes. Once the Channel Tunnel is in place, there may be more people attracted to trains for travelling Paris-London/Brussels-London.

4.3 ENVIRONMENT

The EC Commission is pursuing a policy of encouraging airlines to use more modern and therefore quieter aircraft.

A Directive adopted at the end of 1989 (OJ L363) requires airlines with landing rights in the EC to comply with the most up to date noise standards when acquiring or leasing new planes. Aircraft currently in use do not have to comply with these standards, but may not be imported into the EC from a non-Member State.

The basic principle it establishes is a non-addition principle: from 1 November 1990, Member States will no longer be able to add aeroplanes to their registers which do not comply with the standards specified in Part 2, Ch3, Vol 1 of Annex 16 to the Convention on International Civil Aviation (ICAO) to their registers.

Planes conforming with Chapter 3 standards are generally those which were awarded their Airworthiness and Noise Conformity certificates after 1977. The oldest models satisfying the standards of Chapter 3 are the Airbus A300, the Tristar, the DC 9-80 and the Boeing 737-200, along with a large number of aircraft to which a new engine or special noise reduction equipment can be added. There are certain exceptions to this rule.

Older, used aircraft may come to be unloaded in third country markets as a result.

It is important to note that once a product complies with EC permitted sound levels, it may be marketed throughout the EC. Member States are not allowed in this case to adopt higher standards.

In February, 1990 , the Environment Commissioner announced that the Commission is expecting to go beyond the non-addition principle, to the principle of the non-operation of planes that do not conform to the ICAO Chapter 3 standards. This is judged to have the potential to effectively ground 5,300 aircraft. A supporting Directive setting the strictest internationally agreed noise pollution standards for modern aircraft will be proposed, with the intention of applying it to all aircraft. It appears that this ban would come into force in 1995, with a total ban effective some time soon after the year 2000. Details of the planned emission norms are not clear at this stage. The proposal is being finalized at this time.

A parallel proposal, exempting the poorer African countries from ban on Chapter 2 aircraft, is also being planned.

It is expected that tighter noise pollution requirements in Europe will have positive effects on the aerospace industry due to reinforcement of the need to replace aircraft.

4.4 RESEARCH & DEVELOPMENT

There are two major sources of funding relevant to aerospace research and development in the EC. The first are EC programs and the second is the European Space Agency.

EC Commission R&D Programs

In July 1988 the Commission released a communication titled Toward a programme of strategic measures in aeronautical research and technology in Europe. (COM 88/294)Key technology areas were identified in the following disciplinary areas:

- aerodynamics
- structures
- materials
- acoustics
- computation
- airborne systems and equipment
- propulsion
- manufacturing and design technology
- operational systems, and
- multidisciplinary (integration)

The funding program to support this is the BRITE/EURAM program. The EC Council awarded a budget of ECU 35 million ($US 43 mn) for initiatives in these areas, although the total cost is ECU 65 million ($US 79 mn).

There are Norwegian and Swedish participants in one or two of the 28 projects which go to make up this programme. EFTA country companies are allowed to participate in the programme under certain restrictions. Canadian and other non-EC firms are not eligible for funding.

Other EC programs are in effect to support research and development initiatives in specific technological areas. There may be aeronautical applications indirectly. These are:

ESPRIT:

Information technology

-1988-93 budget of 3.2 bn ECU ($US 3.9 bn)

BRITE-EURAM:

Industrial technologies

-1989-92 budget 439.5 million ECU ($US 537 mn)

RACE:

Advanced communications

-1987-91 budget 1.1 bn ECU ($US 1.3 bn)

The EC is using these programs to direct money to research and development efforts in high technology civilian and military applications.

Not all EC support is in the form of program funding. For example, EUREKA acts to bring companies together for research purposes without contributing to the funding of the research itself. EUREKA currently has two programs related to aerospace. These are:

1. **EUROFAR** - for advanced European rotor aircraft

   It aims at the mastering of the technology for the civilian version of the tilt rotor aircraft - involves Aerospatiale, Aeritalia, Agusta, MBB, Westland & Casa. The programme runs from Jan 88 to Dec 90 on feasibility studies; 50% public, 50% private finance, but only involves ECU 30 million (about $US 37 million).

2. **EUROPARI** - development of Advanced Manufacturing/computer integrated manufacturing technologies

   - involves British Aerospace, CASA, Fokker, Aerospatiale & Aeritalia
   - definition phase:12 months
   - development phase:48 months
   - a range of partners are being sought to cover both software and marketing expertise & other users

A program on satellite communications with aeronautical applications is expected later this year.

European Space Agency

The ESA was created in 1975 to promote peaceful cooperation in space research. The ESA signatory states include Sweden, Switzerland, Norway, and Austria in addition to the majority of EC countries. Canada is an associate member. Close coordination with the EC is necessary to ensure minimal overlap between initiatives. With a total budget of over ECU 1 billion, the ESA accounts for approximately one half of the European funding on space efforts.

The ESA has targeted the following areas for research:.

- industrial standardization
- telecommunications - integration of ESA & EC satellite programmes
- earth observation - environmental monitoring
- microgravity

It is important to remember that defence-related research is done on a national basis and therefore a large amount of space research is done independently from the EC and ESA efforts.

4.5 PUBLIC PROCUREMENT

Purchases by EC national governments, traditionally supplied by domestic manufacturers, are to be opened up to non-national suppliers in the water, energy, transport and telecommunications sectors. Public procurement accounts for 15% of EC GDP. However aircraft are specifically excluded from the scope of these proposals. Furthermore, defence remains specifically excluded from the EC's competence according to the EC's Treaty of Rome (Art. 223).

Article 30 of the Single European Act 1986 states that,

> "The High Contracting parties consider that closer cooperation on questions of European security would contribute in an essential way to the development of a European identity in external policy matters. They are ready to coordinate their positions more closely on the political and economic aspects of security. (They) are determined to maintain the technological and industrial conditions necessary for their security".

This is indicative of an emerging EC role in defence and security matters, although no real substantive changes in policy are in place. An EC security and defence policy would likely result in the opening-up of military aerospace procurement within the EC.

4.6 COMPETITION POLICY

State Aids

The Commission is taking an increasingly tough stance on state aids to industry. The Commission suspects that state aids will, after the completion of the Single Market, replace the traditional means of protecting domestic industry from foreign competition.

It is expected that subsidies granted to state-owned or controlled companies will be more stringently and extensively vetted by the Commission. Member States may be asked to give annual reports on their financial relations with nationalized enterprises. This is relevant in France for instance where some aerospace companies are either owned or quasi-owned by the state.

The Commission has to examine "the effects and not the merits of public ownership"; that is, it does not question state ownership in itself but it has to make sure that states do not abuse their position to circumvent Articles 92-94 of the EC Treaty.

Measures that can breach these rules are, inter alia, the injection of capital or equity by governments, debt write-offs, direct grants, low interest loans, tax credits and capital participation. The EC has the power to require recipients to repay certain types of state-aid. For example, it now appears likely that British Aerospace will have to pay back a £38 million sweetener it received from the UK government in order to "assist it" in the purchase of Rover. Renault now is required to repay one half of $US 2.1 billion in subsidies received from the French government.

Merger Control

In December of 1989, the EC adopted a Directive granting the Commission authority to prohibit mergers, acquisitions and certain joint ventures ("concentrations") of a Community-dimension that would have anti-competitive effects in the EC. Concentrations that would otherwise violate this competition standard may nevertheless be permitted where "their contribution to improving production and distribution, to promoting technical or economic progress or to improving the competitive structure within the common market outweighs the

damage to competition." It may be decided that further EC consolidation of the aerospace industry will be allowed because of anticipated improvements in technical progress.

Mergers with a Community dimension are those in which the combined worldwide turnover of the parties exceeds 5 billion ECU ($US 6 bn) and where the turnover of any two of the parties within the EC exceeds 250 million ECU. At the request of an individual Member State the Commission may examine smaller M&As. The new rules are effective from 21 October 1990. How this authority will be exercised is unclear at this time.

4.7 COMPANY LAW

The EC has a proposal for consideration to allow for the formation of European companies. The current system requires incorporation and regulation under the laws of only one member state. In many instances, the national laws work to the disadvantage of the "foreign" partner in a joint venture, or the wholly-owned subsidiary of a "foreign" company.

Under this proposal, a European company would be formed by two or more companies which have head offices in different states. There are several options for the actual form of the new company. Consolidated financial reporting would be one of the benefits of forming the European company.

Airbus Industrie was created as a consortium under French law. The four partners (Aerospatiale, M.B.B., British Aerospace, and CASA) are responsible for their own shares and the shares of the other partners. The lack of financial accountability resulting from this structure meant that Airbus was a financial drain on the partners despite success in the marketplace. Airbus is likely to be one of the first to take advantage of the European company law statute.

4.8 TAXATION

To achieve many of the benefits of the Single Market, it will be necessary to reform the taxation systems in the member countries. At this time, there are different rates of excise and value-added tax throughout the EC, as well as different categories of exemption. A number of reforms are under consideration at this time including:

- harmonization of excise duties on kerosene, diesel and other fuel within a certain band by the end of 1992.
- harmonization of value-added taxes within a certain band, and
- elimination of double taxation of profit transfers between parent and subsidiary within the EC

Taxation reform is particularly contentious among the member states and as a result, the certainty of reforms is lower than in many other areas.

4.9 SOCIAL CHARTER

The EC Social Charter, which was adopted late in 1989, includes a series of measures designed to improve worker's conditions, such as limitations on working hours. However, most of the recommendations made by the Commission are going to be no more than just that; they will be recommendations which the Member States are not bound to implement.

In any case, with aerospace generally being one of the most well-paid industries in Europe, the Social Charter would not be expected to have significant effects on aerospace companies. Labour costs for aerospace manufacturers are not expected to increase as a result.

4.10 TRADE POLICY

The exclusion of trade in military products from the Common Customs Tariff (CCT) has been a basic principle of the EC since its foundation. The Commission is seeking to limit the list of military products which benefit from an exclusion from the application of the EC's CCT. If there is a gradual change in the EC's policy on military trade and the CCT becomes more widely applied, this at least has the potential to affect the sales of non-EC arms producers in the Community.

The EC is a signatory to the GATT agreement on trade in civilian aircraft. The agreement forbids signatories from requiring or pressuring airlines or other purchasers of civil aircraft to buy from any particular source. Furthermore, signatories agree to avoid attaching inducements of any kind to the sale or purchase of civilian aircraft (this is as much a procurement issue as a trade issue).

The GATT agreement also forbids the signatories from applying tariffs to aircraft or aircraft parts. However, this only applies to around 80% of aircraft parts; as regards the other 20%, the EC has the right to apply tariffs and would normally indeed apply its CCT to such parts.

But at present Council Regulation 3173/89 means that there is a temporary suspension of the CCT duties for certain products intended for the construction, maintenance and repair of (civilian) aircraft (products which normally fall within the 20%). The reasoning behind this measure is to grant total suspension of the duties where EC production of the product in question is minimal or non-existent, and partial suspension where EC production only partly caters for EC requirements. This helps EC producers to meet the needs of users industries in the Community.

5.0 OPPORTUNITIES, CHALLENGES AND RESPONSES

5.1 INTRODUCTION

Preceding sections of this report have described the Ontario industry in terms of its competitiveness, the European industry, and the policies which are being adopted at the European level which will impact the evolution of the European industry.

The specific market opportunities which may develop in Europe over the next decade will be the result of a number of inter-related factors, each of which are difficult to predict. These include:

- the actual impacts of EC 1992 and other European policy initiatives
- general market forces driving demand (ie. GDP growth, fleet replacement)
- levels of military spending
- developments in Eastern Europe, and
- specific actions taken by major aerospace companies.

The intention of this report is not to estimate or forecast market segment sizes after considering these and other influencing factors. Rather, we describe general opportunities that are likely to emerge to make Europe a more desirable place for Ontario aerospace companies to do business.

5.2 OVERVIEW

Overall, the current situation in Europe represents a potential opportunity for Ontario companies for a number of reasons: the European market is likely to be more open to internal competition, cooperative ventures appear to be increasingly significant as companies explore what they have to offer one another in the areas of technology; expanded research capabilities etc. In general terms, the market is likely to become more dynamic. Further, penetrations of the Western European market may form a good base for dealing with Eastern Europe.

While doing business in Europe is more difficult than in the U.S. at present, measures like technical harmonization may well mean that Europe will become a single market for both EC and non-EC firms, in part because there would need to be only one entry point to Europe rather than the dozen or so which characterized the market in the past.

A more competitive European aerospace industry will likely be one that has more contracts to be taken up by subcontractors, perhaps Ontario subcontractors. The precise effect will, however, depend upon the competitiveness of Ontario manufacturers.

On the other hand, the pace of change, the significant unknowns surrounding the eventual structure of European industry and the likely demise or drastic readjustment of many companies in this process give rise to competitive risks for Ontario companies interested in penetrating the European market.

The increased competitiveness of the European market will likely result in stronger competitors for Ontario companies in their traditional markets. This increased competitiveness may occur as a result of greater economies of scale, or increased specialization or more effective concentrated research and development both within companies and through cooperative ventures.

Finally, the 'inwardness' that some expect will characterize European decision making in the coming years as it adjusts to EC 1992, German reunification and the re-emergence of the Eastern Europe market might suggest a 'Fortress Europe' mentality. While this may happen in some sectors, given that the European aerospace industry is totally integrated into the world industry both on the supply and demand sides, it is unlikely that this will be a significant obstacle to continued European sales.

5.3 OPPORTUNITIES AND CHALLENGES

The EC policies described in Chapter 4 of this report will have a number of direct and indirect impacts on the Ontario aerospace industry. Opportunities and challenges will also arise from the evolution of the EC industry and market for aerospace products. These opportunities and challenges are described briefly in this section.

Research and Development

The EC Commission has sponsored a number of R&D programmes in the aerospace area and other programmes exist that are generally focused on R&D. Current EC research programs are expected to further strengthen the technical capabilities of EC firms. As a result, it is expected that more formidable competitors will emerge.

It is unlikely that Ontario firms can benefit directly from these R&D programs. Generally speaking, it will be necessary for Ontario firms to find EC partners to access R&D program funding. This has the added benefit of providing opportunities for Ontario companies to develop relationships with EC companies, as well as an understanding of the EC market. It is significant to note that Mitsubishi has entered into a joint research program with MBB.

Alternatively, Canada is an associate member of the European Space Agency and therefore Ontario companies should have access to some of this R&D funding. The government of Ontario circulates information on ESA initiatives to interested parties.

Public Procurement

It is difficult to draw any conclusions concerning the direction that public procurement will likely take in the near term. It is of importance largely because of its potential impact, rather than because of anything tangible that is occuring at present. Defence procurement remains outside the EC's scope for the time being and aircraft were left out of the procurement proposals.

However, things are gradually changing. Developments in NATO and EC movement towards political union could have profound implications for the EC aerospace industry. If a more 'European' defence policy emerges, it may be that national aerospace firms will no longer be able to rely on their government's business as their basic work. This will further increase the pressure on EC firms to improve competitiveness as well as provide the opportunities to become larger scale producers.

Merger & Acquisition Control

A considerable number of mergers and acquisitions have already taken place in the aerospace industry and more are likely under way. It appears that the EC Commission will play a larger role in regulating such mergers but there are conflicting indicators as to whether or not further consolidation will be allowed.

If further consolidations are allowed, EC firms will become larger scale producers or improve their technological capabilities. However, if greater restrictions are placed upon EC firms, there may be more willingness to look outside, possibly to Ontario firms, for partners.

European Company Statute (ECS) Proposal

Statutes regarding management and cost control of companies operating in Europe may be changed in the next few years. The provision of a 'European framework' is significant in that it will provide a legal framework for companies to act at the European level, rather than as national entities. It is expected that Airbus Industrie, among others, will take advantage of the ECS proposal when it is adopted and implemented, although considerable uncertainty surrounds the timetable for such legislation.

Taxation

The recent proposals to eliminate current double taxation problems ought to remove the fiscal obstacles that have discouraged some firms from thinking in European, rather than in national terms. Steps toward harmonizing European corporate taxation rates or other reforms appear to be significant for EC and non-EC business in terms of creating a level playing field and simplifying European operations.

Technical Standards

Technical standards are being simplified in Europe, largely through a process of mutual recognition of the standards of member states. This will significantly lower the product design, certification, and manufacturing costs for European companies selling products into other European countries This will, in turn, make these companies stronger competitors elsewhere.

Ontario manufacturers will also enjoy the benefits of the development of European standards and simplified certification. Companies such as Boeing de Havilland, and suppliers of major systems, like Menasco, will face lower costs and presumably faster access to EC markets.

Environmental Standards

Community environmental standards are becoming more stringent. This applies to noise levels as well as pollutants. The DASH 8 turboprop aircraft, is a modern and efficient aircraft that should be well placed to be marketed as an 'environmentally friendly' product. Windows of opportunity may emerge for other Ontario companies that have leading edge technology in the environmental area. In fact, there may be opportunities for these products to become the industry standard.

Transportation Liberalization

The European Commission intends to deregulate or liberalize air traffic through such measures as the abolishment of capacity-sharing and reform of the fare-setting process. The objective is to allow market forces to play a greater role in the evolution of traffic patterns and the emergence of stronger European airlines. The expected results would be less drastic than was the case during the period of U.S. airline deregulation.

Possible scenarios for change will include:

- increased east-west traffic
- greater passenger-mile volumes
- new and expanded airports
- evolution of fewer European carriers and more commuter airlines

A result of the EC approach to liberalization is that various sources have forecast (although sometimes in contradiction) increased demand for:

- smaller commuter aircraft
- larger more efficient aircraft
- navigation systems
- air traffic control systems
- ground based support equipment

The latter two would be the result of the increased use of secondary airports to cope with air traffic congestion at most major airports in Europe.

The liberalization of the air transportation regulatory environment will have a major impact on the evolution of the industry and therefore the demand for aircraft and equipment.

Market Size & Growth

The European aerospace market, while only about half the size of the U.S. market, is very large by Canadian standards. It is also growing and will probably continue to do so as Western European firms increase sales to the world market, including Eastern Europe.

Market Segments

As the European industry is much smaller than that of the U.S. it is correspondingly less self sufficient. Import data indicate that European imports of airframes and engines account for the bulk of imports. Commuter aircraft sales are increasing. Engines imports may grow as sales of EC aircraft continue to grow.

Equipment and other material imports are significant, accounting for about 15% of imports in 1988. This has risen by about 19% annually between 1984 and 1988 in nominal terms. It suggests that Ontario firms may find opportunities to export equipment and other materials.

Business opportunities will primarily be within the civilian aerospace sector. In contrast, military expenditures are expected to decline.

The space sub-sector has grown more rapidly than others and may continue to do so.

Location Of Opportunities

The main industrial area of Europe is a triangular area which includes northern Germany, northern France, and southern Britain. The aerospace industry in Europe is predominantly located in these countries, but somewhat outside the traditional industrial areas. For example, some of the U.K. industry is located in the north, the German industry is located around Munich in the south, and the French industry is centred near Toulouse. Therefore, the largest opportunity for increasing sales or collaborative ventures may well be in these countries as both primes, and many important suppliers, are located close to one another.

Other countries do have significant aerospace capabilities and should not be ignored. These are: Italy, Spain, and Sweden (although not part of the EC).

Summary

The competitive structure of the European aerospace industry is evolving as companies are repositioning themselves to compete in the new European market and worldwide. Some manifestations of this include mergers and acquisitions and redirection of the focus of some company activity. Less efficient companies in both the civilian and military sector may have trouble competing with more dynamic and efficient firms, especially if a measure of national protection and procurement is taken away.

This means that Ontario companies should be careful in choosing any joint venture partner and, before expending considerable effort in a marketing campaign to a potential customer, should determine that they are effective competitors. The wave of merger activity may also mean that such new firms will become higher cost in some areas and there may be more room for agile smaller competitors that can supply the larger European firms with product at a lower cost than it could produce internally.

Thorough competitive intelligence will be necessary to monitor the moves of companies as they "retool" and "refocus" their efforts.

It appears that the European aerospace industry will become a more significant competitor in the future as it seeks to expand its presence in the global aerospace industry. Firms in this market may provide greater competition for Ontario firms both in domestic markets and in the U.S. market. On the other hand, entry into European markets may provide the best opportunities for growth for many Ontario companies.

5.4 STRATEGIC RESPONSES

EC 1992 and other market related developments in Europe will make it more attractive and more important for Ontario aerospace companies to do business in Europe. The opportunities and challenges described in the previous sections, combined with the increasing globalization of the aerospace industry, suggests that the European market must be considered seriously by the Ontario aerospace industry. The specific responses open to Ontario companies wishing to address these opportunities will clearly have to be tailored to individual circumstances including:

- financial strength,
- autonomy / mandate,
- management capabilities,
- product attributes,
- process technologies, and
- R&D capabilities.

Financial strength is important because entering new markets, particularly those far from the domestic market requires a considerable investment of time and money. For Ontario-owned companies, there are generally no restrictions on export activities. Subsidiary companies will not always have the authority to explore new business opportunities. As companies rationalize production responsibilities as part of the globalization of business, management should ensure that they have the authority to seek new markets and develop new products. To be successful in the European market, it is important to have a management team with strong technical capabilities, marketing skills and preferably some international experience. Obviously, an Ontario product must be equal to, or better than, European products in the features most important to the potential customer. Manufacturing process technologies must be current. Integration of the customer into the design process and operation of a just-in-time system will improve competitiveness. Finally, since Ontario companies are slightly disadvantaged by higher transportation costs, there is a greater probability of success for companies that are able to differentiate their products with technology and sustain this advantage over time.

Table 17 on the next page provides a simplified assessment of the relative positions of the four major types of aerospace companies in Ontario in terms of the key success factors identified above. In doing this, we have assumed that the companies in each category are relatively similar in nature. Obviously, our generalizations are not true for all companies in any category.

TABLE 17

COMPARISON OF FIRM-TYPES BY KEY SUCCESS FACTORS

KSF	Primes	Major Sub-systems	Major Sub-contractors	Third Tier Suppliers
Financial Strength	- potential major strength	- medium strength	- limited backing	- generally limited
Autonomy / Mandate	- global product mandates	- some global product mandates	- restricted	- local / domestic
Management Capabilities	- international experience	- technology based, some international	- engineering / manufacturing	- engineering / manufacturing
Product Attributes	- good niche products	- niche systems	- specific components, limited size capabilities	- "build to print"
Process Technology	- average	- average	- limited	- limited
R & D Capabilities	- product/process oriented	- product oriented	- restricted	- generally, very limited

Given the inter-relationships of the Ontario companies, increased EC sales by a prime would have a major impact on the other three categories. Primes and some suppliers of major sub-systems should be in a favourable position to increase sales. The major sub-contractors success will be limited unless they are able to develop broad mandates for supplying a number of primes with different products. Most third tier suppliers will likely be successful in Europe only where the product is input into a system or final product.

Our research indicates that there are four basic strategic options available to companies wishing to increase their penetration of the European market. They are as follows:

- Participating in research and development projects, either with individual companies or groups of companies under private sector arrangements or under the governmental auspices;
- Concentrating on selling to European primes or suppliers of major systems;
- Entering into joint ventures with European companies; or,
- Acquiring a European company.

These strategies would assume different forms depending on individual company circumstances and on the type of business the company is in. In particular, the company's position as a supplier of components, a provider of proprietary systems or an original equipment manufacturer will have an important effect on the type of strategy adopted.

It is impossible to develop a detailed strategy for each company in the industry, or even a representative sample of companies. However, we have provided a much simplified analysis of the merits of these options for each of the four basic company types in Table 18. In doing this, we have assumed that the companies in each category are relatively similar in nature. Obviously, our generalizations are not true for all companies in any category.

TABLE 18

ASSESSMENT OF MARKET ENTRY OPTIONS

OPTION	Primes	Major Sub-systems	Major Sub-contractors	Third Tier Suppliers
Product Research & Development	- with competitor	- access to technology & EC primes	- not major R&D requirements	- NA
Export	- current success with this option	- possible but extensive design involvement difficult	- lack of size and focus	- limited direct opportunities
Joint venture / Merger	- joint manufacturing not economical - production rationalization	- possible gains to be achieved	- difficult, given size	- difficult, given size
Acquisition	- high cost of buying a competitor but possible synergy	- possible	- financial constraints	- NA

This suggests that the most desirable options for a prime are to export into the EC market or make an acquisition. Major sub-systems manufacturers could potentially be successful with any of these options, however the R&D and acquisition strategies may be the best. Major sub-contractors would generally be restricted by their subsidiary status and small size and there does not appear to be a preferred option. Third tier suppliers may be most effective through supplying larger companies.

Each company must assess these market entry options in consideration of its own relative position in the industry. Specific barriers to entry, such as shipping costs, lack of reputation in the market, and economies of scale must be considered. The market demand for specific products and services must be estimated based upon the changing EC policies identified in this report, as well as the regular underlying determinants of demand.

Numerous examples exist of non-European companies that have adopted one or more of the basic strategies to penetrate the European market. We will discuss them in the context of the basic options identified above.

Research & Development

The way the European prime/supplier relationships have developed in the past suggests that one way to develop relationships with European primes or suppliers of major sub-systems would be to work together with them on joint research and development projects.

A common feature of the majority of co-operative research and development efforts is that these are linked to potential joint manufacturing opportunities. It appears as though firms do not pool resources simply to take advantage of research programs and then use the results to compete against each other.

Examples include:

- Singapore Aerospace and China National Aero Technology are working with Aerospatiale to develop and build a new helicopter. Aerospatiale will pay slightly over 50% of the cost with the other two parties covering the rest. Aerospatiale hopes to sell between 1,500 and 2,000 units.
- General Electric began with an alliance with SNECMA for the development of the CF6 and CFM56 engines. More recently, a new agreement was signed for the GE90 programme which will include a 25% participation by SNECMA.
- An agreement between Rolls Royce and Sukhoi/Lyulka (USSR) to develop a new engine for a supersonic business jet.
- The establishment of a study group by Daimler-Benz and Mitsubishi to carry out research into the areas of small passenger planes, engines, space technology and ultrasonic aircraft.

Another interesting feature of these agreements is the longevity of the relationships either in reality or in intent. In many of these examples, the specific venture builds upon a previous relationship.

Export

It is difficult for a non-EC firm to export products to the EC market. Although some of the barriers such as standards, are declining, a number of general business considerations remain as obstacles. For example, service performance and transportation costs can place the exporter at a disadvantage. The increasing integration of suppliers into the product design process tends to provide advantages to a local company.

Despite these obstacles, companies that have clearly superior products and that can negotiate mutually beneficial agreements with European primes can successfully export to EC markets providing the technical standards are satisfied. For example, Canadair has been awarded a contract to supply components for the Airbus A330 and A340.

Joint Ventures/Mergers

These joint ventures differ from the R&D joint venture in that the relationship is more focussed on the manufacture of a developed product or delivery of a service. Although these arrangements involve different degrees of lost autonomy over operations, or parts of operations, they have the advantage of each partner making a commitment to the success of the "new" venture.

Two examples of these forms of business ventures are as follows:

- The engine subsidiaries of Daimler-Benz and United Technologies have merged their aero-engine businesses in order to counter the General Electric/SNECMA alliance. Aeritalia, the Italian state-owned aerospace group is working with Pratt and Whitney to develop a more powerful version of the PW4000 jet engine.
- A U.S. company (Space Industries Inc.) and a European company (Intospace GmbH) are jointly marketing a microgravity processing service. The service offers researchers the ability to conduct microgravity processing at an affordable cost. Intospace was established to form a link between space companies and manufacturers. It has 94 European companies as shareholders and will market the service in Europe.

The usual problems associated with the management of joint ventures and mergers are magnified when dealing with differences in language, culture, customs, and legal and business practices.

An alternative form of joint venture would be one which included two non-EC companies working together to reach sufficient critical mass to address the European market opportunities. This reduces the problems described above, but still has the disadvantage of "looking-in from the outside."

Acquisition

Acquisitions in Europe by non-European companies is difficult. There are few companies that can afford the cost of searching for candidates and making an acquisition. There are even fewer companies that have the financial capabilities in addition to having found a company with the "right fit".

One well known acquisition was the Bombardier acquisition of Short Brothers, the Irish producer of commuter aircraft and military hardware.

BIBLIOGRAPHY

Airbus Industrie. Market Perspectives for Civil Jet Aircraft. 1990.

Association of European Aerospace Manufacturers (AECMA). "The European Aerospace Industry in Panorama of EC industry 1990. EC Commission, 1990

BIPE/Cambridge Econometrics. Europe in 1994, 1990.

EC Commission. "BRITE/EURAM Area 5: Specific Activities Relatingto Aeronautics." Progress Report & Project Synopses. January 1990.

EC Commission. "Council Regulation (EEC) 3137/89 of 16 October 1989, temporarily suspending the autonomous Common Customs Tariff duties for certain products intended for the construction, maintenance and repair of aircraft. "Official Journal of the EC. L311, October 26, 1989.

EC Commission. "Towards a Programme of Strategic Measures in Aeronautical Research and Technology for Europe." COM (88) 294 294/2. July 19, 1988.

Ernst & Young and Metropolitan Toronto. Aerospace Capabilities Guide. July 1990.

Ernst & Young, Metropolitan Toronto and Ontario Ministry of Industry, Trade and Technology. Aerospace and Defence Workshop. June 1990.

Ernst & Young. The US Defense Industry: Key Issues for the 1990's. 1989.

Euroconsult. Situation de l'Industrie Spatiale Européene et Evolution des Principale Firmes Spatiales Européenes: Analyse des Societies Francaises. September 1987.

Euroconsult. Competitiveness of the European Civilian Aircraft Manufacturing Industry: Comparison with the United States & Prospects to 2000. April 1989.

Euroconsult. L'Industrie Sspatiale Européenee. April 1989.

Joint Aviation Authorities. Aviation Safety Authorities in Europe. 1986

NATO Independent European Programme Group. Towards a Stronger Europe. 1986. (Includes list of defence products outside the EC's competence).

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